



Resource Management 2017



Researcher Joy Erlenbach and National Park Service Ranger Kelsey Griffin observe bears in the sedge meadows at Hallo Bay. Foraging observations help scientists gain an understanding of how important different food resources are for coastal brown bears. It is one component of the multi-part Changing Tides research project. To learn more, see page 3.

Each summer, National Park staff working in Katmai National Park and Preserve, Aniakchak National Monument and Preserve, and the Alagnak Wild River, spend time in the field to study, inventory, and monitor cultural and natural resources. Summer is the time to do it: rivers are flowing, wildlife is active and study sites are accessible. With more than 4.73 million acres between the three park units, this is a busy time of year.

Resource Management falls under three main groups: cultural resources, natural resources, and inventory & monitoring. The cultural resource program involves archeology and anthropology and focuses on the history of human occupation in the region. The natural resource program studies biological and physical resources, such as wildlife, fish, plants, wilderness, and backcountry resources. The third group, inventory and monitoring, is part of a National Park Service effort to understand the status of the park's natural resources. The Southwest Alaska Network (SWAN) Inventory and Monitoring Program cooperates with the park to conduct various surveys to understand how park resources may change over time.

Throughout this field season, look for project and research updates on our website (www.nps.gov/katm), Facebook page, and through the explore.org Katmai bear cams. We hope that you enjoy reading about the many projects occurring in these remarkable parklands. See you in the field!

Research Permits

In addition to work conducted by NPS staff, external researchers come to the parklands to conduct a wide array of studies. Projects include investigations of the ongoing volcanism in the area, climate, wildlife ecology, and contaminant accumulation. The diversity of work helps to answer local management questions as well as those of greater interest to science. The parks are a vibrant, living laboratory.



A brown bear observed at Hallo Bay, Katmai National Park.

Geophysical Survey (GPR)



Archeological technician Chloe Stevens and Tommy Urban navigate the 250 MHz GPR through a large cultural depression west of Brooks Falls.

2017 marks the third and final year of collaborative ground-penetrating radar (GPR) work between the Katmai Cultural Resource Program archeologists and CESU researcher Dr. Tommy Urban of Cornell University. The differential frequencies detected by the GPR instruments provide archeologists a view into deeply-buried house depressions that are otherwise invisible at ground-level without disturbing intact soils.

The 2015 and 2016 seasons focused on identifying cultural resources within the developed areas of Brooks Camp, and investigating several previously unsurveyed anomalies visible on 2011 LiDAR imagery within the Brooks River Archeological District and National Historic Landmark (XMK-0204). The District includes at least one thousand cultural depressions of houses and caches that represent over four thousand years of human habitation along the ancient terraces of Brooks River. The 2016 fieldwork indicated the "new" depressions west of Brooks Falls and south of the camp road are indeed of a cultural origin.

A workplan for 2017 includes wrapping up testing at several sites in Brooks Camp and conducting a baseline survey on the Katmai Coast, specifically the historic village of Douglas-Kaguyak. Prior to the 1912 Novarupta eruption, Douglas Village was the end of a long-established portage route between the Pacific Coast and Bristol Bay.

In the late nineteenth-century, the Kaguyak settlement was inhabited by Sugpiat/Alutiiq people associated with the Savonoski villages to the east, and Katmai village to the southwest. The survey intends to locate and examine obscured footprints of any former historic or pre-contact structures in the vicinity. The American Period (1867-1912) buildings at Douglas included several "barabara"-style homes, a Russian Orthodox Church, and an Alaska Commercial Company store.



Archeological technicians prepare a survey grid while Urban directs a magnetometer across a probable cultural depression.

Savonoski Drainage Archeological Survey



View of Kaguyak Crater during a pre-season aerial survey.

2017 marks year two of a three-year survey of the Savonoski and Ninagiak River drainages. In 2016, Katmai Cultural Resource personnel interviewed several Bristol Bay community members whose family histories are linked with the historic Savonoski and Naknek villages. This June, a crew of NPS archeologists headed by Sam Coffman of UAF-Museum of the North will survey the drainage east of the Rainbow River confluence, looking for evidence of short-term camps and village sites that likely supported the historically-documented travel between the Katmai coast and the lower Savonoski drainage.

Tribal and Corporation Consultation

The Cultural Resource Program continues to work with Alaska Regional Office to facilitate Government-to-Government and Section 106 Compliance National Historic Preservation Act (NHPA) tribal consultation. In 2016, Katmai park staff met with members of several federally-recognized tribes, village corporations, regional corporations, and the Council of Katmai Descendants to discuss current park projects and issues.

Park staff are also engaged in a new partnership with Bristol Bay Native Corporation, which recently acquired the Katmailand, Inc. concession that operates lodges at Brooks Camp, Grosvenor Lake, and Kulik Lake.

Nutritional and Landscape Ecology of Brown Bears on the Katmai Coast:

This summer will be the third and final summer of the Changing Tides study. This multi-faceted project investigates the link between terrestrial and nearshore environments. A large component of the study is looking at the importance of intertidal resources for brown bear health. Data collection includes GPS-collared bear locations, hair and blood samples, and observational work.

So far, we've been impressed by the diversity of strategies we've seen exhibited by bears on the coast, both in terms of diet and habitat use. During the pre-salmon season (May-mid July) some bears use intertidal areas frequently—as much as 19% of their locations—while other bears use them during as few as 0.4% of their locations. However, many bears (8/14) use intertidal areas over 10% of the time. We know from our observational work that some bears use intertidal areas for clamming, fishing for flounder, or foraging on barnacles or whale carcasses, and sometimes for preying on seals and sea otters. Evidence of this is seen in the bears' hair and blood samples, which show elevated signatures consistent with marine resource use during a time when salmon are not available. Some bears use sedge meadow habitat at high rates (up to 30% of the time), with 8 of 14 bears using it more than 10% of the time. As with intertidal use, though, some bears use sedge meadows infrequently—as few as 1% of their locations. In spite of the differences in behavior, all bears during the pre-salmon season gained weight—between 5 and 63 kg—most of them consuming primarily vegetation.

Next, we're taking a closer look at the availability of different resources in relation to how bears choose them, which will help us more accurately rank different habitat types in terms of the bears' preferences. We'll also use the body condition information we have from the collared bears to determine



Researcher Joy Erlenbach collects vegetation samples to be used in dietary estimation of coastal bears.

which resources give the bears the most “bang for their buck” in terms of body-mass or body-fat gains. We're excited to incorporate the information from the bears' activity sensors into understanding their specific behaviors in different habitats (especially those we can't easily observe), as well as to understand their daily activity patterns and energy expenditure. So far, morning activity for most bears (11/12) peaks around 9 am and are maintained at high levels throughout the day, although we did have one bear with more nocturnal tendencies reaching maximum activity levels around 5 am and 10 pm. We will continue to collect and analyze data this year and look forward to sharing more information with you throughout the season. Keep an eye out for future updates, and always let us know if you have questions.

A Genomic Perspective on Katmai's Brown Bears



NPS Ranger and researcher Michael Saxton processes samples for analyses. Genetic analysis will allow us to create a pedigree of Brooks Camp bears, and see how they connect with bears throughout the Park and Preserve.

Katmai is home to one of the most widely viewed populations of brown bears on the planet. But where do

the bears go when we cannot see them? In 2016, park biologists initiated a study to use genomics to shed light on gene flow throughout the Park and Preserve. This information will help to illuminate movement patterns of bears and understand how bears are connected across the park. By collecting samples from along the coast and at various locations in the interior of the park, biologists will be able to analyze gene flow and determine if bears are crossing the mountain range that traverses the park between the coast to interior regions. Sampling will continue in 2017, with coastal samples collected as a part of the Changing Tides project, while interior samples will be collected via hair snares at multiple locations and biopsy darts at Brooks Camp and in King Salmon. The use of biopsy darts at Brooks Camp will allow researchers to visually identify bears as they are sampled. With this information, they will be able to construct a pedigree of the local population and evaluate the level of inbreeding in the Brooks bears. The information gained from this study will provide valuable insight into the genetic health of the population and help inform management decisions impacting these amazing animals.

Invasive Plant Management

Invasive and exotic plants are considered the second greatest threat to biodiversity after habitat loss. They display rapid growth, spread with little or no human assistance, and are expensive to remove and difficult to control once established. In Katmai, we are working to prevent the establishment and expansion of exotic and invasive plants.

In 2016, field work for the Exotic Plant Management Team (EPMT) was carried out from June through September. In August, a six person Student Conservation Association crew assisted with control work at Brooks Camp. Fieldwork included invasive plant surveys carried out in high visitor use locations and controlling populations that were discovered. Priority locations included Brooks Camp, the Valley of Ten Thousand Smokes (Valley) road, Fure's Cabin, Grosvenor Lodge, Battle River, Nonvianuk Lake, and various backcountry sites within Katmai.

Brooks Camp, the Valley road, and Fure's cabin were visited monthly for surveys and control work, while most other areas were only surveyed once during this season. Chemical treatment was carried out at Brooks Camp, Fure's Cabin, Nonvianuk Lake, and Battle River targeting common dandelions. Manual removal was utilized on all other invasive plants found.

Water samples to test eDNA for presence of *Elodea* were collected from 12 lakes that were thought to be at the highest risk for becoming infested with *Elodea* from float plane visitation. These samples were processed and returned to the Central Alaska Network in Fairbanks for testing.



SCA intern Christine Devries performs exotic plant management field work in Katmai.

In 2017, the EPMT will plan to revisit the same sites as in 2016 and continue chemical and manual treatment for invasive plant species. The EPMT plans to survey and map new backcountry areas as well as assist the USFWS with control work on lands adjacent to the park. This summer the park will continue surveys for *Elodea* at various freshwater sites.

For further information on invasives in Katmai National Park and Preserve, or to report a suspicious terrestrial or aquatic species, please contact the Exotic Plant Management Team at **907-246-2156**. Identification materials for both native and non-native species are available upon request to help visitors identify species in the field.

Monitoring Bear Numbers on Brooks River



Bears concentrate at Brooks Falls for ample fishing opportunities.

Are the number of bears using places such as Brooks River in Katmai National Park in Alaska changing? Because of the high concentration of bears observed at Brooks River, this location offers a unique and effective opportunity to view and count bears without using costly techniques such as collaring.

Each July and September for the past 20 years, a park biologist has monitored the number of bears feeding at Brooks River during salmon runs and has identified individual bears through physical and behavioral characteristics. Bears have been assigned three-digit identification numbers in an effort to track individual bears using the river from season to season and year to year. New or unidentifiable bears are given new numbers each year.

With this information, Katmai can monitor the number of bears using the river each season and how that number has changed through time. Research has begun to calculate survival rates of bears using Brooks River and factors that might affect the number of bears returning each year. A better understanding of how the bear population fluctuates can provide insight into the overall health of the surrounding ecosystem. This study will also provide information on how bear populations regulate themselves and how they may be affected by environmental changes.

Soundscape



Sound equipment installation at Dumpling Point in late July, 2016.

The sounds around us can have a powerful impact on our emotions and enhance our experiences. At Katmai National Park and Preserve, natural sounds such as the call of American Robins or Greater Yellowlegs can signify the beginning of Spring. The purring sound of nursing bear cubs can delight visitors at Brooks Camp, whereas the sound of an animal sniffing around outside a tent at Hallo Bay can make for a fitful night's sleep for the campers. Natural sounds are an important component of the natural world and the park service strives to protect these resources.

In 2015, Katmai National Park, in cooperation with the NPS Natural Sounds and Night Skies Division, began a three-year soundscape inventory throughout the park's wilderness. Each year, sound recording equipment is installed at several backcountry locations where it records continuously for a month. During 2015 three sites were deployed, and in 2016 six sites were deployed. The timing of noise events and their energy (loudness) are of particular interest in this study. Noise impacts the wilderness character of the park by affecting both the naturalness of the ecosystem and the solitude that can be experienced by visitors.

In 2015, equipment was installed at Swikshak Lagoon, Pfaff Mine and in the Valley of Ten Thousand Smokes. In 2016, sound equipment was installed at Cape Douglas, Hallo Bay, and Katmai Bay on the coast, as well as at American Creek, Jo Jo Lake and on Naknek Lake in the park's interior. In 2017 the park anticipates deploying six more stations, located at Contact Creek, Ikagluik Creek, West Kukaklek Lake, Crosswinds Lake, Kamishak River, and Amalik Bay. If time allows, a station may be deployed at Lake Camp.

For more information on natural sounds research in the National Park Service go to: <http://www.nature.nps.gov/sound/index.cfm>

Late Cretaceous dinosaurs and their environments - Aniakchak National Monument



Drs. Tony Fiorillo and Yoshi Kobayashi documenting dinosaur footprints in Aniakchak National Monument.

In 2001, the first recorded dinosaur fossil for any National Park Service unit in the Alaska Region was discovered in a rock unit known as the Chignik Formation. This discovery was made during a

general paleontological survey of Aniakchak National Monument (ANIA). While there are now numerous records of dinosaurs from Cretaceous rocks around the state of Alaska, the record of dinosaurs from the Mesozoic rocks of the southwestern part of the state remains very limited.

Now that so much more is known about dinosaurs and their environments from comparably-aged rocks elsewhere in Alaska, it was time to return to where the Alaska Region NPS dinosaur started. In 2016, an expedition to ANIA has revealed over 30 new track sites, dramatically increasing the dinosaur record from the Alaska Peninsula. The footprint assemblage from this part of the Chignik Formation is dominated by the footprints of the duck-billed dinosaurs, or hadrosaurs. The hadrosaur tracks range in size from those made by likely full-grown adults to juveniles. Rare tracks attributable to armored dinosaurs, or ankylosaurs, as well as fossil fishes, are also known from the new localities. These discoveries now make ANIA the NPS unit with the second most abundant dinosaur record in the Alaska Region. Future work in this park will continue building on what we think we know about the charismatic megafauna of the deep past.

Other Natural Resources Programs for 2017

- **National Oceanic and Atmospheric Administration (NOAA) standing stock survey**

We will continue long-term marine debris monitoring to document type and density of debris wash-up. Coastal sites include Swikshak Bay, Hallo Bay, Dakavak Bay and Aniakchak National Monument.

- **Coastal Observation and Seabird Survey Team (COASST) surveys**

In a partnership with the University of Washington we will continue to monitor Swikshak and Hallo Bays to document seabird mortality (count and identify beached birds). This will provide us with baseline data so that we may better understand the effects of environmental stressors such as changing climate, severe winters, and oil spills on seabird species.

- **Seabird Colony and Marine Mammal Haul-out Mapping**

We will complete a seabird colony and marine mammal haul-out inventory that was started last season. Updated information on colony and haul-out locations will help us to better understand population sizes and species use along the Katmai Coast.

- **Stream and Meadow Surveys**

Aerial bear surveys are flown over coastal meadows (June) and select salmon streams (July and August) at regular intervals to document bear use at these important seasonal foraging areas.

- **Backcountry Impacts Monitoring**

Rangers will collect field data including photos and GPS locations to document human impacts (evidence of camping, etc.) in the backcountry.

- **Spatial Data Collection**

Park GIS specialists will opportunistically collect GPS locations to geo-reference aerial photos and to update the Alaska Region database of buildings and installations.

- **Statewide Digital Mapping Initiative**

A contractor for the State of Alaska will collect coordinates from a few locations in Katmai as a control for digital maps produced from aerial photography.

- **Using Hydrogen and Oxygen Isotopes in Volcanic Glasses for Paleoclimate Reconstruction**

A researcher will study isotopes exposed in the vents of extinct fumaroles in the Valley of Ten Thousand Smokes to determine the value for reconstructing climates of the past.



Harbor seal haul-outs and seabird colonies will be surveyed along Katmai's coast this summer.



USFWS/K Payne

Glaucous-winged gulls are a common sight along the Katmai Coast.

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